ELEC 327: Digital Systems Laboratory (Spring 2021)

Syllabus

Instructor: Caleb Kemere
Office: BRC 971
Office Hours: (please verify via email) Monday, Wednesday 8:00-9:00am (RMC Coffee House)
caleb.kemere@rice.edu

Grader/TA:

- Sibo Gao (sg63)

Lab Assistants:

- Josue Casco-Rodriguez (jc135)
- Justin Cheung (jrc17)
- Samantha Fuentes (sf26)

Lab Office Hours:

- See Canvas

Lab Communication:

- Sign up for elec327.slack.com

Additional Lab office hours may be requested on Slack or by email

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Text Book: There is no text book, but you should take care of the MSP430 Launchpad you will be given.

Class Hours: TuTh 1:30-2:50 PM BRC284/AL124 Until everyone is vaccinated, lectures will be dual mode (Zoom+in person optional). We will figure out a schedule for the lab that ensures minimal contact. Students are expected to spend significant out-of-class time (~10 hours per week) working on lab assignments.

Lab Help Sessions: See Lab Assistant hours or by request on Slack or through email
Help sessions held in lab room A124
Lab Access Keypad Code: ...– -.... —-. —-. #

Course website:
We use 2 different digital resources:

1. The primary location assignments and lecture notes (and other resources) is the course website – http://elec327.github.io
2. We use Canvas (https://canvas.rice.edu/courses/39195) for announcements and for communication. If you have specific questions about course content or assignments, please post them on Canvas. As a corollary, you may find it useful to check for answers as questions arise.
3. We additionally use Canvas for assignment submission and for posting rubrics for peer-grading.

Course Description: One of the most critical aspects of modern computer systems involves interfacing with the world. This course will focus on how power-efficient user-facing systems are built.

Objective: Students should learn the fundamentals of embedded system programming and feel competent to design, build, and manufacture their own embedded devices. Furthermore, students should understand how embedded systems interface with external peripheral devices. Students should understand how application-specific blocks enable modern commercial devices. Finally, students should understand how to design and build their own embedded systems including printed-circuit board design and assembly.

Outcome: Students completing the course should be able to:

1. Identify the key blocks in an embedded system
2. Understand key aspects of embedded systems algorithms (interrupts, modules)
3. Understand standard serial communication protocols
4. Utilize software tools to program embedded devices
5. Utilize software tools to design printed circuit boards
6. Design, assemble, and program their own embedded devices
7. Exhibit creativity in designing, building, and programming a real-time sensor processing system

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Prerequisites: ELEC 220. Also useful are 240 and 241.

Grading: Grades will be based on: approximately five lab modules (25%), a midterm project (20% each), a final project (30%), a skills matrix/class participation/in-class quizzes (25%). A number of extra credit options will be available throughout the semester for a maximum of 30% of the final grade. Late assignments may be accepted (with penalty), except for printed circuit board orders , where late submissions may not be accepted. Students wishing to submit late assignments should contact the instructor prior to the due date.

Honor code: You are encouraged to work **with** other students in ELEC327 on the labs. Each student should turn in their own lab writeup (except for midterm and final project, which should be done in pairs). I would like you to write your own code and (especially) comments for the labs. If you share code or design elements with other students in the class you **MUST** cite this in your returned assignments.

Required Textbooks and Supplies:

No textbook is required. Students will be provided with one MSP430-G2553 Launchpad. A large solderless breadboard may be useful for prototyping. Prototyping jumpers will be available in lab. A larger solderless breadboard can be purchased, for example, on Amazon for $30-40.

Lab Cleanliness:

Historically, the lab space has not been maintained in a neat and orderly manner. Starting in 2017, we will implement spot inspections and **class-wide grade deductions** to try to ensure that a high quality working and learning environment is maintained.

Waste: In the process of learning how to assemble (i.e., solder) surface mount devices, there has been not-insignificant waste, where things end up on the floor. While we would prefer to avoid artificially limiting students supplies, we will do so if waste is not contained.

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